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## FIELD OF THE INVENTION

5           The present invention relates to a method and apparatus  
for selecting a device most appropriate for a user out of a  
plurality of devices connected to a network. This invention  
also relates to a computer product.

10 BACKGROUND OF THE INVENTION

It is common to connect many devices providing same or similar type of service to a network. A user, who is operating a PC (personal computer) or the like, selects one device out of these many devices to enjoy a service. The specifications of the service which the selected device can provide must conform to the conditions for executing the service requested by the user (settings relating to capability and functions).

Conventionally, the devices which can be used on the network are detected, listed, and notified to the user. The user then selects one device from the list and obtains detailed information relating to the individual functions and capabilities of the selected device. The selected device is used when the user has determined that it is appropriate based on the above information. On the other hand, when the user determines that the device is not appropriate, he selects

another device.

However, if a great number of devices are connected to the network, and the user wishes to execute a service under specific or complex conditions, the operation of selecting the device and setting the service conditions for it must be repeated many times until a device is found which is appropriate to the user's requirements. Moreover, the user must input the execution conditions each time. This is inefficient and inconvenient.

Let us consider printing as the service. In this case, many printers are connected to the network. One of these printers is selected (may be by default) and a document, image or the like is printed on this printer. In the case of special cases such as color printing or printing on both sides of a paper, printers which comprise these functions are identified by their names (for example, product names) and selected accordingly. When it is not possible to determine from the names of the printers whether they comprise the required functions, one printer is selected and detailed information relating to its functions and capabilities is checked. When the selected printer does not meet the requirements, the user tries another printer until he finds an appropriate printer.

#### SUMMARY OF THE INVENTION

It is an object of this invention to make it possible

to automatically select a device merely by inputting the conditions for the service which are demanded by the user.

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The device selecting apparatus according one aspect of the invention comprises a detecting unit which detects devices  
5 connected to a network; an extracting unit which extracts profiles comprising information relating to categories of the detected devices; a table creating unit which creates a table showing priority rankings for the use of the devices; an integrated profile creating unit which creates an integrated  
10 profile comprising information obtained by integrating the profiles of the devices; a user interface creating unit which creates a user interface enabling necessary categories to be selected from the categories which comprise the integrated profile; and a selecting unit which selects a device to be used  
15 from the devices based on the selection result and the table.

According to the above invention, the user can automatically select a device to be used merely by selecting the necessary categories from category information representing capabilities and functions and the like of the  
20 devices. Furthermore, since the necessary categories are selected from an integrated profile comprising information created by integrating profiles of the devices, the user need not clearly specify the device to be selected.

Further, the integrated profile creating unit creates  
25 the integrated profile by integrating the most highly capable



the categories. Accordingly, when a new category has been selected following the selection of one device, a device which comprises the category selected this time can be selected by priority, enabling a device to be selected in accordance with  
5 the user's intentions.

Further, the devices are printers. Therefore, to automatically select a printer to be used, the user need only select the necessary categories from category information representing capabilities and functions and the like of the  
10 printers.

A device selecting method according to another aspect of this invention comprises the steps of providing beforehand a table showing an integrated profile, comprising information obtained by integrating profiles comprising information  
15 relating to categories of devices which are connected to a network, and priority rankings for the use of the devices; creating a user interface which enables necessary categories to be selected from the categories comprising the integrated profile; and selecting a device to be used from the devices  
20 based on the selection result and the table.

Accordingly to the above invention, in order to automatically select a device to be used, the user need only select the necessary categories from category information representing capabilities and functions and the like of the  
25 devices. Furthermore, since the necessary categories are



Further, when a new category has been selected via the user interface after the device has been selected, the step of selecting reselects the device by including the category which has been selected this time by priority in the part of the categories. Therefore, when a new category has been selected following the selection of one device, a device which comprises the category selected this time can be selected by priority, enabling a device to be selected in accordance with the user's intentions.

10       The computer-readable memory medium according to still another aspect of this invention which stores programs for allowing a computer to execute the steps of detecting devices connected to a network; extracting profiles comprising information relating to categories of the detected devices; 15 creating a table showing priority rankings for the use of the devices; creating an integrated profile comprising information obtained by integrating the profiles of the devices; creating a user interface enabling necessary categories to be selected from the categories which comprise 20 the integrated profile; and selecting a device to be used from the devices based on the selection result and the table.

Accordingly to the above invention, in order to automatically select a device to be used, the user need only select the necessary categories from category information 25 representing capabilities and functions and the like of the





an operation of the device selecting apparatus;

Fig. 8 is a plan view of a screen display illustrating an operation of the device selecting apparatus;

Fig. 9 is a plan view of a screen display illustrating  
5 an operation of the device selecting apparatus; and

Fig. 10 is a plan view of a screen display illustrating an operation of the device selecting apparatus.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

10           A preferred embodiment of the present invention will be explained below with reference to the drawings. Fig. 1<sup>✓</sup> is a block diagram showing the hardware constitution of a device selecting apparatus according to an embodiment of this invention. As shown in Fig. 1, the device selecting apparatus  
15   1 comprises a PC connected to a network 2 such as the internet. In addition to the device selecting apparatus 1, a plurality of other devices are connected to the network 2.

In the device selecting apparatus 1, a ROM 4 which stores BIOS and the like and a RAM 5 which stores various types of rewritable data are connected to a CPU 3 via a bus 6. Following devices are also connected to the bus 6 via an interface (not shown in the diagram) and various control circuits (not shown in the diagram). That is, an external memory apparatus 7 such as a hard disk which stores various types of programs and fixed data, a CD-ROM drive 9 which reads the contents of a CD-ROM

8 comprising a memory medium, a communications controlling apparatus 10 which controls communications between the device selecting apparatus 1 and the network 2, a display 11, a keyboard 12, and a mouse 13.

5           Programs described later are stored in the CD-ROM 8. The programs stored on the CD-ROM 8 are read using the CD-ROM drive 9 and installed on the external memory apparatus 7. These programs operate on a predetermined OS. Instead of the CD-ROM 8, a variety of memory media such as a floppy disk, an optical  
10 magnetic disk, and a DVD may be used.

Following is the list of the examples of such programs.

1. Network Device Detection Program: a program for detecting devices connected to the network 2. The program detects not only devices (other than PC) which are connected directly to  
15 the network 2 but also devices which are connected thereto via a PC.

2. Device Profile Extraction Program: a program for extracting information (termed "profiles") relating to categories of functions and capabilities of each of the devices  
20 detected in the program "1". A profile is expressed as a collection of categories, the categories comprising category name, type of category value, and initial value. The type of category value represents the range of values obtained for that category. For example, a list of whole integers or specific  
25 numbers is specified. An example of a category is "category

name: number of prints, type of category value: natural number,  
initial value: 1", and such like.

3/. Priority Ranking Creation Program: a priority ranking  
table ranks the devices according to the priority of their  
5 execution. This program creates a table which ranks a  
plurality of devices based on a predetermined reference.

4. Execution Conditions Settings Management Program: a  
program which creates an integrated profile based on the  
collected profiles of the devices and manages the conditions  
10 for executing service based on this integrated profile  
information, information input in a user interface environment  
explained later, and the priority ranking table. The  
integrated profile is a profile integrating the categories of  
the devices so as to form a sum total of the most highly capable  
15 categories which make up the profiles of the devices. The  
integrated profile constitutes a profile of an ideal virtual  
device comprising all the capabilities of the devices.

5. Execution Conditions Setting Program: a program which  
realizes a user interface, in which the user sets the execution  
20 conditions. These execution conditions may be set using the  
display 11, the mouse 13, the keyboard 12 and the like. An  
example of a screen display based on this user interface will  
be explained later with reference to Fig. 3.

Subsequently, processes from setting conditions for  
25 executing a program with regard to the devices connected to

the network 2 to specifying the execution of the program will be explained with reference to the flowchart shown in Fig. 2.

As shown in Fig. 2, the user specifies the service he  
wishes to execute. This specification of service may be

5 performed via a user interface which has been established by the execution conditions setting program (step S1). Then, the CPU 3 executes the network device detection program and thereby detect all the devices which are connected to the network and are capable of executing the specified service (step S2). Step  
10 S2 realizes the detecting unit and the detection step.

Based on the device profile extraction program, the CPU 3 extracts information (profiles) representing the categories of the devices which were detected in the step S2 (step S3). Based on the execution conditions settings management program,  
15 the CPU 3 creates an integrated profile which collects the most highly capable categories from the profiles of the devices (step S4). Based on the priority ranking table creation program, the CPU 3 creates a priority ranking table (step S5). The data of the profiles of the devices extracted in the step  
20 S3, the data of the integrated profile created in the step S4 and the data of the priority ranking table created in the step S5 are stored in the RAM 5 (see Fig. 1). The memory unit and memory step is realized by storing the data of the profiles of the devices which were extracted in the step S3 in the RAM  
25 5. Furthermore, the step S3 also realizes the profile



printer name display column 25 displays the name of the printer which is presently selected, and is displayed below the column displaying the category names 21. Creating the user interface in compliance with the execution conditions setting program  
5 realizes the user interface creating unit and the user interface creating step. The execution conditions which were input in the step S6 are stored in the RAM 5 as execution conditions data (see Fig. 1).

In accordance with the information representing the  
10 execution conditions which were input in the step S6, the CPU 3 refers to the profile data of the devices which is stored in the RAM 5 in compliance with the execution conditions settings management program, and selects the device among the devices satisfying the execution <sup>selected ones</sup> conditions which is "ranked  
15 highest" in the priority ranking table (step S7). This realizes the selecting unit and the selecting step.

When the user changes the setting for a category A, leading to a contradiction between the category A and a category B which is already set, the category B is made invalid and the  
20 category number 23 of the category A is added to the invalid setting category number display column 24 of the category B. "Contradiction" signifies that there are no devices capable of executing the category B setting among the devices capable of executing the category A setting.

25 In this case, device comprising a part of all the

categories selected by the user in the check box 22 are selected.  
That is, categories for which a category number 23 of another  
category is displayed in the invalid setting category number  
display column 24 are deleted from all the categories selected  
5 by the user, and the devices comprising the remaining  
categories are selected.

Sometimes the category B, which was made invalid to  
eliminate a contradiction, may become valid when the user  
changes the setting of the category A. This happens when there  
10 is a device which satisfies the settings of both categories  
A and B..

Following the step S7, the screen display is updated  
based on the result of the step S7 (step S8). When the user  
specifies execution (YES in step S9), the selected device  
15 executes the service based on the selected execution  
conditions (step S10).

When the user does not specify execution in the step S9,  
that is, when the user further adds or changes the services  
he wishes to execute via the user interface established by the  
20 execution conditions setting program (NO in the step S9, step  
S6), the process from the step S7 onwards are repeated.

When a contradiction arises after the user selects a new  
category in the check box 22 in the step S6, the category which  
has been selected this time is not deleted but is kept by  
25 priority, without displaying the category number 23 of any of

the other categories in the invalid setting category number display column 24 of the category which has been selected this time. Consequently, a device is always selected which comprises the category which has been selected this time in  
5 the step S7.

Subsequently, a specific example of the processes of the steps S6 to S9 will be explained. For the sake of simplicity, the profile category type is a logical type having a value which indicates only whether the profile has the category or does  
10 not have it. In this example, four printers (first to fourth printers) are provided on the network 2 as devices capable of executing printing. Fig. 4A shows the profile of the first printer, Fig. 4B shows the profile of the second printer, Fig. 4C shows the profile of the third printer, and Fig. 4D shows  
15 the profile of the fourth printer. In Fig. 4A to Fig. 4D, the category names 21 show the categories of the category name 21 of each printer.

Fig. 5 shows an integrated profile which is created by collecting from these four profiles the categories which have  
20 the "highest capabilities". Fig. 6 shows a priority ranking table which is created based on a predetermined reference for determining (e.g. faster in printing, installed nearby, etc.). As shown in Fig. 6, the first printer is the default and is number one in the priority ranking. Two categories, multiple  
25 printing and high resolution printing, are selected by default



from the start. Fig. 7<sup>✓</sup> shows a screen display in the initial state of setting the execution conditions (step S6). As shown in Fig. 7, all the category names 21 which make up the integrated profile of Fig. 5, and the check boxes 22, category numbers 5 23 and the invalid setting category number display columns 24 corresponding to the category names 21 are displayed on the screen.

"O" is displayed in the check boxes 22 of the two categories of multiple printing and high resolution printing which are 10 selected by default from the start, and "X" is displayed in all the other check boxes 22. The default first printer is displayed in the printer name display column 25.

Suppose "postscript printing" and "sorting" are selected on the screen. The printers capable of satisfying 15 these printing conditions are the first and second printers according to the profiles of Fig. 4A to Fig. 4D. The first printer will selected based on its priority ranking in the priority ranking table. Fig. 8 shows the display on the screen at this point.

20 Suppose "printing on A3 paper" is selected on the screen. According to the profiles of Fig. 4A to Fig. 4D, only the third printer has this function, and will therefore be selected. Since the third printer cannot perform postscript printing, this category is made invalid by displaying the symbol "-" in 25 the check box 22 corresponding to postscript printing. In

order to clearly show that postscript printing has been made invalid due to the selection of printing on A3 paper, the category number 23 "g", which is the category number 23 for printing on A3 paper, is added to the invalid setting category  
5 number display column 24 which corresponds to postscript printing. Fig. 9 shows the display on the screen at this point.

When the user cancels printing on A3 paper and selects color printing, the fourth printer is selected. Now postscript printing becomes valid. Fig. 10 shows the display  
10 on the screen at this point. Since postscript printing has been made valid, the display may be returned to the initial state shown in Fig. 7 or to the previous setting shown in Fig. 8. In this example, the former is carried out. Since the fourth printer does not have a sorting function that category  
15 is made invalid by inserting "-" in the check box 22 corresponding to sorting. In order to clearly show that sorting has been made invalid due to the selection of color printing, the category number 23 "h", which is the category number 23 of color printing, is added to the invalid setting  
20 category number display column 24 which corresponds to sorting.

According to the above-described device selecting apparatus 1, to automatically select a device to be used, the user need only select the necessary categories from category  
25 information representing capabilities and functions and the

like of the devices.

The necessary categories are selected from an integrated profile comprising information created by integrating profiles of the devices. Therefore, the user need not clearly  
5 specify the device to be selected.

The integrated profile is created by integrating the most highly capable categories in the profiles of the devices. Therefore, the user can select the necessary categories from the most highly capable categories of the devices.

10 The user interface displays information relating to the categories which make up the integrated profile to the user on the display 11. The user can select the necessary categories from among those displayed on the display 11. Therefore, the user is able to select the necessary categories  
15 from the categories of the devices easily.

In the step S7, when no device comprises all the categories which have been selected by the user, a device which comprises a part of the selected multiple categories can be selected instead. In this case, when a new category has been  
20 selected following the selection of one device (YES in step S9, step S6), a device which comprises the category selected this time can be selected by priority, enabling a device to be selected in accordance with the user's intentions.

According to the present invention, in order to  
25 automatically select a device to be used, the user need only

select the necessary categories from category information representing capabilities and functions and the like of the devices. Furthermore, since the necessary categories are selected from an integrated profile comprising information  
5 created by integrating profiles of the devices, the user need not clearly specify the device to be selected.

Further, the user can select the necessary categories from the most highly capable categories of the devices.

Further, the user can easily select the necessary  
10 categories from the categories of the devices.

Further, when it is determined that no device comprises all the categories which the user has selected, a device which comprises a part of the multiple selected categories can be selected and used instead.

15 Further, when a new category has been selected following the selection of one device, a device which comprises the category selected this time can be selected by priority, enabling a device to be selected in accordance with the user's intentions.

20 Further, to automatically select a printer to be used, the user need only select the necessary categories from category information representing capabilities and functions and the like of the printers.

The present document incorporates by reference the  
25 entire contents of Japanese priority documents, 11-255097

filed in Japan on September 9, 1999.

Although the invention has been described with respect to a specific embodiment for a complete and clear disclosure, the appended claims are not to be thus limited but are to be  
5 construed as embodying all modifications and alternative constructions that may occur to one skilled in the art which fairly fall within the basic teaching herein set forth.

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